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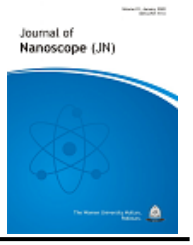


# Comparative Evaluation of Bioactive Potential of Medicinal Plants Extracts and their respective Nanoparticles.


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## Abstract

Nanoparticles are used in each department of wisdom like medicine, engineering and all other areas and still attracting the scientist to invent new ideas and make invention for their own profit, because of their small sizes. New school of thoughts proved that they also have antimicrobial properties. Among various metal nanoparticles, Silver nanoparticles earned a special interest among researchers. These are prepared by some chemical ways with the help of some reducing agents which the passage of time become responsible for different multihued biological risk due to their specific toxicity, Procreate the subdued relate to manifest environment amicable process. There are many biological applications that are used to brim the vacant i.e Natural way of synthesis of biological entities extracted from agricultural waste unveil the pretentiousness across other scientific methods. The agricultural waste endures super regulated convention to make it beneficial for the synthesis of nanoparticles. These bestow blog disclose the bumper variety of plants apply toward fast and unite fashion to prepare the nanoparticles by green synthesis. Which exhibit antimicrobial activities against microbes.



## Keywords

Green synthesis, Nanoparticles, Medicinal plants extract, Antibacterial activity.

## 1. Introduction

Green synthesis is mediated as favorable method of energy efficient, save human health and environment by producing less waste material and safe and healthy products. Green synthesis is environmentally feasible and beneficial method could compete the other chemical and physical method of synthesis and having ability to use in medicine department and play a great role in other useful fields in coming days. The plants extract having ability to act as capping and stabilizing agent. By using FTIR technique, we come to know that how plant extract causes the reduction of silver ion. Spectrophotometer, UV-Visible, TEM, photoluminescence and DLS use to characterize synthesis of silver nanoparticles. The AgNPs exhibit antibacterial activities across both gram positive (Staphylococcus aureus) and gram-negative (Escherichia coli) bacteria. Photoluminescence is used to guesstimate the green synthesized silver nanoparticles.

Plant extract and green waste was used for coherent and fast preparation of AgNPs. The AgNPs prepared by green route were characterized: they have crystalline, spherical, uniform, and monodispersed nanoparticles with 23.7nm approximate particle size. Green synthesized silver nanoparticles disclose excellent antimicrobial activity against the specific pathogens. Levofloxacin is a standard antibiotic against Gram positive and Gram-negative bacteria, now green synthesized silver nanoparticles showed same antimicrobial effects. The application of green synthesis seems to be healthier, non-hazardous, economically beneficial, environmentally feasible and replacing the traditional physical and chemical method. The use of silver nanoparticle for treatment process to lessen the burden of microbes on environment.

Nanotechnology is a supercilious area of recent research conduct with preparation, application and negotiate of small particles confines from 1 to 100nm in size. With respect to this small size, properties are changes in elementary route of idiomatic atoms and analogous mass. Because of nanoparticles size distribution and structure, there are there are different new and unique approaches of nanoparticles and Nano metal increase fatly. In great number of areas, nanoparticles speedily acquire revamp. For example, Cosmetics, biomedical, pharmaceutics, drug gene delivery, food, environment, mechanics, optics, space industries, energy science, catalysts high emitter, single electron transistor, Nano-linear optical devices, and photo-electrochemical applications. A huge number of productions in these spreading technologies had vast applied areas and Novel fundamentals. This involves the growing of Nano-scale material afterwards in investigation and utilization of their surprising physio-chemical and Opto-electronics properties [3-5]

For all the purposes, nanoparticles are used. The silver nanoparticles advised to upbeat due to their extraordinary antibacterial activities because of the great surface area [4]. Due to large surface area of Nano particles, having a great attention of scientist against microbes. Due to their aberrant characteristics, silver nanoparticles gain a lot of interest and these are a crook product in nanotechnology. In Amalgam fibers, Cryogenic super conducting substances, beauty products and aforementioned areas, silver nanoparticles are used due to its anti-inflammatory property.

In pharmaceuticals approaches silver is a unique metal which perform antiseptic function against pathogens, microorganism and distract the life cycle of microorganism and stop their further growth. Due to their vast classification, scientist have more concern toward Nano particles synthesis. Silver nanoparticles used in diagnosis of cancer and treatment. Nanoparticles are designed through various physical and chemical methods that are costly and harmful to society, including this causes a distress to live environment due to poisonous and unsafe material. The product of natural outstanding tentative processes to the synthesis of silver nanoparticles either from "top to bottom" approach or a "bottom to up" approach.

In bottom to top application, Nano particles can be prepared by using different methods by self-assemble of particles of Nano range. While in top to bottom application, proper mass break into small particles by using different lithographic techniques for example, grinding, milling, sputtering and thermal removal. In bottom to top application, for the synthesis of silver nanoparticles the top general strategy is chemical reduction. Sodium borohydride (NaBH4), sodium citrate, ascorbate, elemental hydrogen, Tollen's reagent, N, N-dimethyl formamide (DMF) and poly (ethylene glycol) block copolymers are different organic and inorganic reducing agent, which are used for the reduction of silver ion. In each type of solution for the size stabilization of silver nanoparticles, capping agents are used. The great benefit of this process is that we can synthesize many nanoparticles in a short time. Throughout this kind of preparation, which material is used, that are hazardous and harmful by-products. Due to this reason, scientists use green route of synthesis of nanoparticles so that, to avoid this kind of hazardous and harmful by-products. In case of top to bottom application, evaporation–condensation method is used at atmospheric pressure for the synthesis of silver nanoparticles. In evaporation-condensation method, the basic material is place at the center of furnace that is vaporized into a carrier gas. There are many types of metallic (Ag, Au, Pb sand) nanoparticles that are synthesized by using evaporation/condensation method. There are many drawbacks of this evaporation-condensation method.

For example, "The Unique silver nanoparticles" are dedicating to serious concerning the margin level mileage in each field of science enclosing the pharmaceutical field and may not be avoided due to root of production. Silver nanoparticles are integrated in more than 100 purchaser products because of their medicinal and antimicrobial properties. Due to the vast use of silver nanoparticles, chemist, biologist, physicist, and paramedical staff come close to enhancing the recent enterprises. Therefore, it is a charge of each researcher to illuminate another novel way of synthesis of silver nanoparticles, which should be cost effective and non-hazardous to biological environment. Therefore, it is proved that green synthesis of silver nanoparticles is beneficial for human in each aspect of life.

In this method, no need of extra-ordinary temperature, pressure, and tons of energy. Hence, the use of plant extract among various biological method of synthesis of silver nanoparticles is greatly beneficial instead of microorganism because of facility of betterment, the eco-friendly and energy saving methods to maintaining the processes. Green synthesis is the better way to synthesize silver nanoparticles by economically profitable process and safe the environment from hazardous and toxic chemicals, which are produced by other synthetic methods.

## 2. Green Synthesis of AgNPs by Agricultural Waste Material

Green synthesized silver nanoparticles gain attraction due to its fast eco-friendly, germ free, economic approach and giving a uni-step application for the biosynthesis progression. By combining of phytochemicals contribute to plant like protein, enzyme, amino acid, polysaccharides, alkaloids, tennis, phenolics, saponins, terpinoids and vitamins reduction and stabilization of silver ion occur. The method for nanoparticles synthesis including the gathering of interested plants from accessible places, and then completely washes with fresh tap water to avoid dust and damage parts proceed with pure water to clean remaining trash. These available fresh leaves grind by using liquid nitrogen gas in conventional pestle and mortar. For the preparation of plant broth, almost 10g of fine powder of plant's leaves is boiled in 100ml of distilled water by using hot percolation method. Later on, finally precipitate is filtered completely until there is no unsolvable material arise. To 103M silver nitrate solution, adding a small quantity of plant extract to go the reduction of Ag-to-Ag (0) that is checked by UV-Visible spectrum of the prepared solution at continuous void.

A maximum part of plant used for the preparation of AgNPs. The specific parts of various plants pimped for this purpose. The green fast synthesis was observed in Althernanthera dentate extract's silver nanoparticles which have spherical shape with dimension of 50-100nm.The nanoparticles' synthesis process by using plant extract is almost done in 10 minutes. The green synthesis of silver nanoparticles from plant extract ratifies economically beneficial and rapid process in contrast to other physical and chemical methods. Against pseudomonas aeruginosa, Escherichia coli, Enterococcus feacal and klebsiella pneumonia silver nanoparticles shows antibacterial property. The silver nanoparticles of Acorus calamus was used as antioxidant, anti-cancer and antibacterial effects. For green synthesis of silver nanoparticles, extract of Boerhaavia diffusa plant use as a reducing agent. Analysis done by Transmission electron microscope and XRD show particle size is almost 25nm with face centered cubic structure and spherical shape. The antibacterial activity of silver nanoparticles checked against three bacterial pathogens e.g., Pseudomonas fluorescence, Flavobacterium branchiophilum and Aeromonas hydrophilic, Flavobacterium branchiophilum show a great activity in contrast to two other bacteria. The phytochemicals and phytol-constituent act as reducing and capping agent to stabilize the silver nanoparticles. An average size of spherical shaped nanoparticles is approximately 7-17nm. The size range of crystalline structure nanoparticles is 20-90nm. By TEM analysis, the spherical shaped nanoparticles' size was observed about 5nm to 20nm.It is observed that the color of silver nanoparticles was change with the passage of time to yellowish brown. The body of dried fruit plant is also used in the preparation of silver nanoparticles and having spherical shaped nanoparticles about 16-18nm size and its antibacterial activity observed against many drug resistance bacteria like Streptococcus pyogens, Pseudomonas aeruginosa, Bacillus subtilis, Escherichia coli and Staphylococcus aureus by Kirby-Bauer method. The size of silver nanoparticles of Cocous nucifera in ethyl acetate and methanol is 22nm. It also exhibits substantial antibacterial activity against pathogens like Salmonella paratyphi, Klebsiella pneumonia, Bacillus subtilis and Pseudomonas aeruginosa. The silver nanoparticles of Abutilon indicum extract having spherical shape exhibit great antimicrobial activity against S. typhi, E. coli, S. aureus and B. substilus microorganisms. TEM analysis exhibit that the silver nanoparticles of Ziziphorantenuior extract are of spherical shapes and properly distributed about size range of 8 to 40nm. In a latest record, the silver nanoparticles of leaf of Ficuscaria extract are synthesized on exposure to radiation. The silver nanoparticles of Cymbopogan citrates were synthesized in three hours by incubation of aqueous solution of AgNO3 at 37 C. The silver nanoparticles of Acalypha indica extract were synthesized fastly by krishnaraj et al. in 30 min. At different concentration of AgNO3, spherical shaped silver nanoparticles are synthesized mostly about 15 to 50nm size. The silver nanoparticles of diameter of 6nm has highest fraction. It is reported that by Dwivedi *et al*. that a royal and fast synthesis of silver nanoparticles occur by abhorrent weed Chenopodium album. The silver and gold nanoparticles about 10nm-30nm size are prepared successfully by using leaf extract. It is observed by TEM imaging that spherical shaped nanoparticles have higher leaf extract concentration. The silver nanoparticles of Azadirachta indica leaves were prepared by the reduction of silver nitrate solution examined about 10-35nm. Hevea brasilensis having natural rubber latex due to the use of thermal treatment of AgNO3 solution, Colloidal silver nanoparticles were obtained. The shape of Hevea brasilensis's silver nanoparticles is spherical, with fcc crystalline structure of 2nm-10nm diameter because of antibacterial characteristics of silver nanoparticles, Silver nanoparticles are used in number of environmental approaches. Beside this,it is not clear that use of silver is how much toxic. US FDA, US EFA, Korea's Testing, SIAA of Japan and Research Institute for Chemical Industry and FITI testing, and Research Institute authorize silver nanoparticles used in preparation of different product and it. Due to antimicrobial characteristics of silver nanoparticles, these are used in pharmaceutics and at home.

Due to the anti-toxic properties of silver, silver sulfadiazine is used in burn site infections and silver metal is also used in making of washing machines. Recently silver is mainly used in nanotechnology field and seems mostly in purchaser products. Silver is also used in deodorant sprays to avoid the body's ejecting smell. In field of dye reduction and their removal, silver nanoparticles are used due to high catalytic activities. In the presence of silver nanoparticles, reduction of methylene by arsine is occur. The antimicrobial activities of silver nanoparticles are also observed by growing E. coli in agar plates and LB medium. To check the membrane transport in bacterial cell silver nanoparticles were applied. Green synthesis of silver nanoparticles has been registered containing a pharmaceutical application in controlling the pathogens. The aqueous Piper longum fruit extract and green synthesis of silver nanoparticles exhibit powerful anti-oxidant characteristics. The study of healthier human lung fibroblast cell (IMR-90) and human glioblastoma cells (U251) shows a toxicity of starch coated silver nanoparticles. It is investigated that the change in cell structure, cell quality, metabolic activity, and oxidative stress cause toxicity. The ATP matter of cell produced by nanoparticles are harmful to mitochondria and enhance the output of Reactive oxygen species (ROS). In cancer cells, DNA damage is most remarkable and examined by single cell gel electrophoresis (SCGE) and cytokinesis blocked micronucleus assay (CBMN). The nanosilver based conductors have high frequency upto 220GHz. Silver nanoparticles shows anti-viral activity against HIV-I at non-cytotoxic concentration, but mechanism is not fully illustrated yet. In different in vitro assays, the silver nanoparticles are used against HIV-I antiviral action.

## 3. Antimicrobial Activity of Green Synthesized AgNPs and Its Implementation

Many civilizations used silver for different purposes. A great number of people utilize silver metal as ornamentation, jeweler, and cutlery. Silver is considered beneficial when it is use as jeweler, wares, and cutlery. Silver has an interesting history of antimicrobial activity against contamination of germs. Ancient people utilize silver metal as a neutral killing agent to adhere the inner layered of milk bottles. Silver has anti-microbial activities against microbes of different categories such as gram positive and gram negative bacteria,fungus and viruses. In previous Indian pharmaceuticals system, Silver metal has depicted as antimicrobial agent for various diseases. In 1884, drops of aqueous silver nitrate uses in newborn's eyes to avoid the transmission of Neisseria gonorrhea from infected mothers became a common practice. Silver has most effective antimicrobial activities among all of other metal having same properties. Silver nanoparticles are less hazardous to living cells. Silver metal is generally used in pharmaceutics such as those of injured soldier in world war 1, to discourage bacterial growth. The pharmaceuticals characteristics of of silver metal introduced 2000 years ago. Silver has great antimicrobial effect in the form of nitrate but silver nanoparticles have a large surface area against microbes.

The antimicrobial activities of green synthesized AgNPs rely upon;

1) Capping agent

2) Size and environmental manners

The accurate and final implementation of antimicrobial activity of silver nanoparticles are yet under observation and greatly discussed matter. Silver metal in ionized form show a great antimicrobial activities and positive ion of silver proposed frisky. Silver metal is non-reactive but when meeting aqueous condition or aqueous matter it releases ion and show antimicrobial properties. The positive ion of silver metal make complex with nucleic acid and interact with nucleoside instead of phosphate groups of nucleic acid. The positively charged nanoparticles and negatively charged bacterial cell produce electrostatic force, NPs are positively charged due to the

positive ion of silver metal and silver nanoparticles are proposed an efficient anti-microbial agent. The positively charged silver nanoparticles diffuse into the cell membrane of negatively charged bacterial cell and interact with nucleic acid of microbes and stop the life cycle of microbes. Silver ions of silver nanoparticles when diffuse into the cell, it can interact with purine and pyrimidine base and denature the DNA molecule.

Due to the presence of antimicrobial property, bacterial cell breakage occurs. The gram positive bacteria is less vulnerable than gram negative bacteria because the cell wall of gram positive bacteria is made up of peptidoglycan. The cell wall gram positive bacteria is more thicker than that of gram negative bacterial cell wall, because in gram positive bacterial cell wall the more peptidoglycan than gram negative bacteria. The suppression of cell growth and protein synthesis due to the anti-microbial properties of silver nanoparticles which lead to the DNA escaping. Silver nanoparticles also act as rapid and efficient anti-fungal agent against many different against medications, this causes a serious problem for human being. So, there is a great demand to prepare novel anti-bacterial and anti-viral drugs. Silver has a great history of performing antiseptics and antimicrobial properties and having ability to stop the life cycle of microbes by interacting their nucleotides. Both silver ion and silver nanoparticles have ability to change the 3D structure of protein by interacting their inner disulphide bonds. For the synthesis of silver nanoparticles, use of environmentally inert substances are beneficial and environmentally suitable.

## Conclusion

Scientist has graceful innovational method to produce capable minute beneficial substances. To enhance the use of green synthesized silver nanoparticles by using plant extract follow the repine to manifest eco-beneficial techniques. Green synthesis method is energy saving, economically beneficial and healthier for human being and produce less waste and safe product. Green synthesis of silver nanoparticles attains important appearance by inimitable approaches. Beneficial plants are used for the synthesis of silver nanoparticles against the harmful microbes, which can cause to lose the efficacy of microbes against silver nanoparticles. So,it is proved in present glimpse that in coming days plant extract produce an efficient result. A number of blogs published about green synthesis of silver nanoparticles but yet, there is a great missing of economically beneficial, feasible, profitable method of synthesis of silver nanoparticles. Plants collected from different places for the synthesis of silver nanoparticles have a great variation in their chemical composition and supreme to variation in results in different laboratories. This variation in chemical composition and then in result cause a major problem. There is special need to overcome this problem. By disclosing of those phytochemicals which are reason of intervening the nanoscale synthesis in fast unistep approach to beat the aforementioned matter may contribute the novel alteration about green route of silver nanoparticles.

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